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TITLE OF CASE
Generalised tetanus in a cat.
SUMMARY
<p>This case report describes the presentation of a cat with generalized tetanus, which is uncommon in this species. The onset of clinical signs with focal limb rigidity occurred one week following a wound on the distal limb. The cat progressed to permanent recumbency with generalized signs of extensor rigidity and the classical facial expression as typically seen in generalized tetanus in dogs. After five days of hospitalisation and treatment with metronidazole, tetanus anti-toxin and analgesia, mild improvement in the ability to ambulate was seen. Re-assessment four weeks later after continued nursing management at home showed near complete resolution of the clinical signs. This case report highlights the neurological and clinical signs of generalized tetanus, of which is an uncommon condition in cats, and the success of medical management, which can be achieved in a first opinion setting.</p>
BACKGROUND
<p>Tetanus is a rare presentation in the cat (1, 2, 3,) especially in the generalized form. More commonly a localised or focal form near the wound site is seen (2). We describe the neurological findings, emphasise the importance of having a good clinical history in achieving a diagnosis and explain how tetanus can be successfully managed within a first opinion setting providing there are no secondary co-morbidities.</p>
CASE PRESENTATION
<p>A two year old male neutered domestic short hair had a history of a wound on the plantar aspect of the left metatarsus which was being managed with antibiotics (amoxicillin and clavulanic acid) and a non-steroidal anti-inflammatory, meloxicam (Metacam; Boehringer Ingelheim Animal Health UK Ltd), at a first opinion small animal practice. It was unclear when the wound occurred, as it was noticed when the cat was presented to the primary veterinarian for a left pelvic limb lameness. Following the identification of the wound, there was a five day progressive history of extensor limb rigidity initially affecting the left pelvic limb only with progression to the other limbs. The cat eventually became non-ambulatory after seven days, at which point it was referred. The cat was mainly an outdoor cat and had no known existing conditions but had previously had cat flu as a kitten. He was fully vaccinated and otherwise in good health.</p> <p>General physical examination revealed a thin body condition with a body condition score of 4/9. Thoracic auscultation was unremarkable with a normal heart rate, regular rhythm and good synchronous peripheral pulses. A wound was present on the plantar aspect of the left metatarsus which had healed and formed a scab (figure 1). Rectal temperature was normal at 38.7 degrees Celsius. Neurological examination revealed normal mentation with a non-ambulatory spastic tetraparetic gait and marked extensor muscle rigidity with increased muscle tone in all four limbs, more so in the left pelvic limb. There was increased tone of the neck muscles and increased jaw tone (trismus) with a sardonic facial expression (figure 2). The muscle tone worsened with stimulation, causing hyperextension of the tarsus (figure 3) and muscle spasms. Spinal reflexes (patella reflexes and withdrawals) were not possible to assess correctly due to the amount of increased muscle tone present. The cranial nerves examination were normal including a normal gag reflex.</p> <p>(Video: Neurological examination)</p> <p>Based on the neurological examination the problem was localized to a diffuse upper motor neuron central nervous system disease.</p> <p>The main differential diagnoses for the presenting neurological signs includes –</p> <ul style="list-style-type: none"> • Tetanus • Strychnine poisoning

- Pseudomyotonia or mytonia
- Stiff-man syndrome
- Hypocalcaemia

INVESTIGATIONS

Haematology and biochemistry was performed to look for changes suggestive of inflammation and infection and to evaluate muscle enzymes. Haematology was within normal limits.

Biochemistry revealed an elevated creatine kinase (CK) at 1237U/L (reference range: 10-290) and a mildly increased total protein 81g/l (reference range: 55-79).

Venous blood gas analysis was performed to evaluate mainly electrolytes and documented a moderate acidaemia (pH 7.280; reference range: 7.35-7.45) and increased blood lactate level (3.26mmol/l; reference range: 0.50-2.50). Electrolytes were within the normal reported reference ranges including calcium (1.30mmol/l; reference range: 1.10-1.40) and potassium (4.33mmol/l; reference range: 3.50-5.00).

Electrodiagnostics were considered and discussed with the owners but were not performed due to the high index of suspicion and financial constraints.

DIFFERENTIAL DIAGNOSIS

Based on the history, neurological findings and the presence of a wound, there was a very high level of suspicion for generalised tetanus. Other possible causes of a generalised increased muscle tone despite normal mentation included strychnine poisoning (unlikely due to the progression and lack of exposure), pseudomyotonia or myotonia (unlikely due to the progression and lack of muscle relaxation at any time) or stiff-man syndrome like process (unlikely based on rarity and progression). Hypocalcaemia was ruled out based on a normal blood ionised calcium.

TREATMENT

Treatment of tetanus is supportive medical management with a four step approach –

1. Prevent further toxin production – this includes wound management (if appropriate) such as surgical debridement and antibiotics to remove the bacterial burden. In this case we did not address the wound with surgical exploration and debridement as the wound had completely healed with just a scab formation remaining. We initially started treatment with intravenous metronidazole 10mg/kg q12h for the first five days then onto oral metronidazole on discharge.
2. Reduce further circulating un-bound toxin from binding to neurones – Tetanus anti-toxin was administered in this case, as it was readily available. A total dose of 500IU/kg was given intravenously as over 20 minutes and monitored for signs of anaphylaxis.
3. Reduce the secondary effects of the toxin – the sustained muscle contraction produced can be quite painful and analgesia as well as muscle relaxants are recommended. In this case buprenorphine (Vetergesic; Ceva Animal Health Ltd) was used (0.02mg/kg IV q6-8h) along with methocarbamol (Robaxin-V; Zoetis Inc) (45mg/kg PO q8h) and a midazolam (Hypnovel; Roche Products Limited) continuous rate infusion (0.1-0.3mg/kg/hr). The degree and intensity of muscle contraction can worsen with stimulation so it is advisable to use sedation if necessary and reduce the amount of physical and noise stimulation to a minimum.
4. Prevent secondary morbidities - intensive nursing care is also required to prevent or reduce the frequency of secondary morbidities such as aspiration pneumonia, muscle contractures, hyperthermia, bladder management and cardiac arrhythmias (4). In this case the cat was able to urinate voluntarily and empty its bladder fully. Although the cat was mainly non ambulatory, it was able to shift its weight and thus did not require regular turning. The cat also received intravenous fluid therapy with compound sodium lactate (CSL or lactated ringer's solution) due to the present on the venous blood gas analysis at a rate of 3ml/kg/hr. The cat was also able to eat normally and was offered water at regular intervals.

OUTCOME AND FOLLOW-UP

The cat was discharged five days after initial presentation having gradually tapered off the midazolam CRI and once the cat was on oral medications. Continued nursing management was performed at home due to financial concerns. At the time of discharge the cat had slightly improved with better movement of the thoracic limbs and right pelvic limb, the left pelvic limb however remained in full extension caudally. The cat was continued on oral methocarbamol, tramadol and metronidazole for a total course of three weeks. A follow up appointment was made four weeks after discharge and the cat had returned to normal with a mild stiff left pelvic limb gait.

DISCUSSION

Generalized tetanus is due to release of toxins (in particular, tetanospasmin) by the Gram-positive anaerobic bacteria *Clostridium tetani* within an anaerobic environment such as a necrotic wound (5). The toxin blocks the release of gamma-Aminobutyric acid (GABA) or glycine at the level of the spinal cord and brainstem, leading to the disinhibition of motor neurons and secondary increase in muscle tone affecting mainly antigravitatory extensor muscles. Tetanus is an uncommon presentation in dogs and cats due to their relative natural resistance to the toxin, tetanospasmin (3).

Generalized tetanus has been well documented in dogs but remains uncommon in cats with only a few case reports (3, 6, 7). A more localised form is generally seen in cats, with contraction of a limb or a group of muscles only (2). Since the diagnosis of focal or generalized tetanus is often a clinical diagnosis, it is important to examine the patient thoroughly for the presence of any wound and to review the history for a recent wound or surgery to raise the level of clinical suspicion. Diagnosis is heavily based on the presentation and course of disease (2). Baseline bloods such as haematology and biochemistry usually reveal mild non-specific changes but may aid supportive treatment, such as in this case with

a moderate acidaemia in increased lactate, likely secondary to the increased anaerobic metabolism of the muscles during sustained contractions. Electrodiagnostics have been reported to aid in the diagnostic work-up of tetanus with (among others) the presence of simultaneous spontaneous activity in agonistic and antagonistic muscle pairs and continuous motor unit discharges during rest and under general anaesthesia (8). However, it is not usually required and may not be readily available in general practice.

Other possible diagnostic tests include culturing the causative bacteria from the wound site and measuring serum antibody titres against tetanus toxins, however these have been reported to be unreliable (9, 10). Treatment of tetanus is usually medical although surgery may be indicated for wound debridement. Human studies have shown shorter recovery times and lower mortality rates with metronidazole compared to the traditionally used penicillin (11,4). Metronidazole is the antibiotic of choice, due to its bactericidal action against anaerobes and that it is effective even in anaerobic environments, with an extended oral course of two weeks, however intravenous administration may be required in the initial management (1). Tetanus anti-toxin can be administered in the early stages of tetanus, if available. A test dose of 0.1ml should be given intradermally first to check for adverse reactions but this does not reliably predict hypersensitivity (4). However, there is no convincing evidence that tetanus anti-toxin has an effect on the outcome (12).

Intensive nursing management is usually required once patients become non-ambulatory to try prevent or reduce the occurrence of secondary co-morbidities such as severe hyperthermia, urinary tract infections, decubital ulcers and aspiration pneumonia (13). From studies in dogs with generalised tetanus, the prognosis is generally good for those cases that respond to medical management and do not incur secondary complications (such as hyperthermia and aspiration pneumonia), although reported survival rates ranged from 55% to over 95% (3). The time to initial signs of improvement usually takes at least 10-14 days in order for new receptors or synapses to form, however return to normal function can take much longer (months) and there may be some persistent complications such as muscle contractures or rapid eye movement sleep behaviour disorders (14).

LEARNING POINTS/TAKE HOME MESSAGES

This case highlights the importance of the history, progression of signs and neurological examination to be able to derive the correct diagnosis with limited diagnostics. The following learning points reinforce this:

1. It is important to construct a thorough history to include the possibility of a recent surgery or wound.
2. There are limited differential diagnoses for generalized persistent increased muscle tone with this type of onset and progression.
3. The prognosis of tetanus is good with medical management, providing there are no secondary complications.
4. 4. The time to initial signs of improvement can take 10-14 days.

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FIGURE/VIDEO CAPTIONS

Figure 1. Image of the wound present on the distal aspect of the left metatarsus
Figure 2. Picture of patient with trismus and sardonic facial expression
Figure 3. Image showing the hyperextension of the hock

OWNER'S PERSPECTIVE

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